INSTRUCTION MANUAL

NL200 Network Link Interface

12/11

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NL200 Network Link Interface

1. Introduction

The NL200 Network Link Interface allows Campbell Scientific dataloggers to communicate over a local area network or a dedicated Internet connection. This Ethernet interface can be connected to either the datalogger's CS I/O port or RS-232 port.

2. Cautionary Statements

- The device driver for the NL200 must be installed on your computer before you can connect to the NL200 via USB. See Appendix D for instructions on installing the device driver.
- Device Configuration Utility 2.01 or higher is required to communicate with the NL200. The latest Device Configuration Utility can be downloaded from our website, www.campbellsci.com/downloads.
- CR1000, CR3000, and CR800-series dataloggers require operating system version 23 or higher in order to operate with the NL200 in bridge mode. The latest operating systems can be downloaded from our website, www.campbellsci.com/downloads.
- Ensure maximum protection against surges. Use a shielded Ethernet cable or external surge protection. Keep RS-232 and CS I/O connections short.

3. Quickstart

Out of the box, the NL200 is configured for operation as a CS I/O and RS-232 serial server. In this mode, the NL200 can be used to communicate with nearly all current Campbell Scientific devices over an Ethernet / Internet network connection.

3.1 Physical Set-up

Power the NL200 through the barrel connector jack located on the edge of the device. Connect the NL200 to your local network using an Ethernet cable, attaching one end to the NL200's Ethernet port and the other end to your network. Connect the supplied SC12 serial cable from the NL200's CS I/O port to the datalogger's CS I/O port or from the NL200's RS-232 port to the datalogger's RS-232 port.

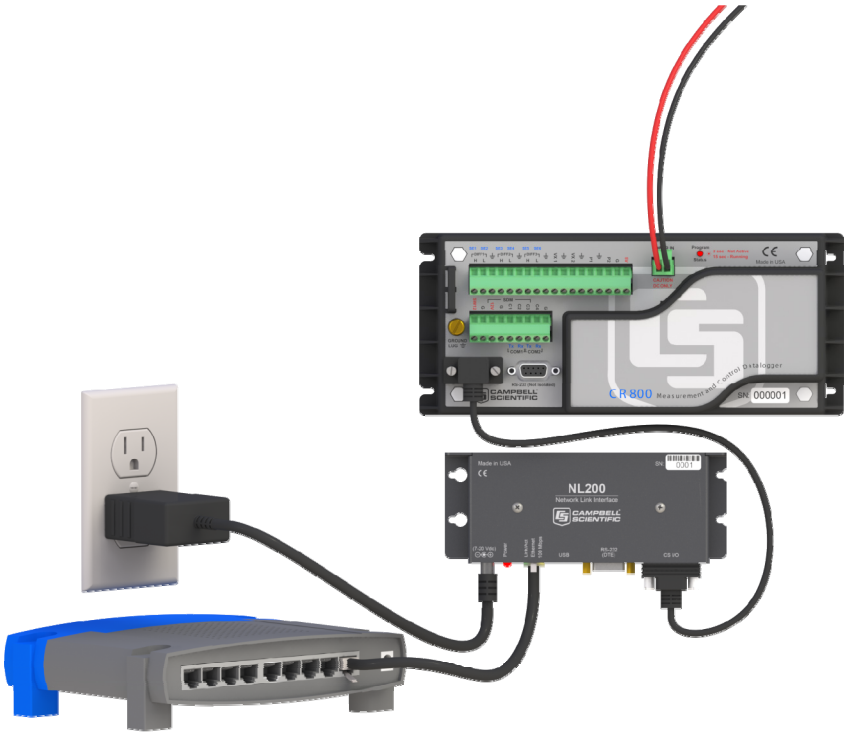


FIGURE 3-1. NL200 with CR800 (external power)

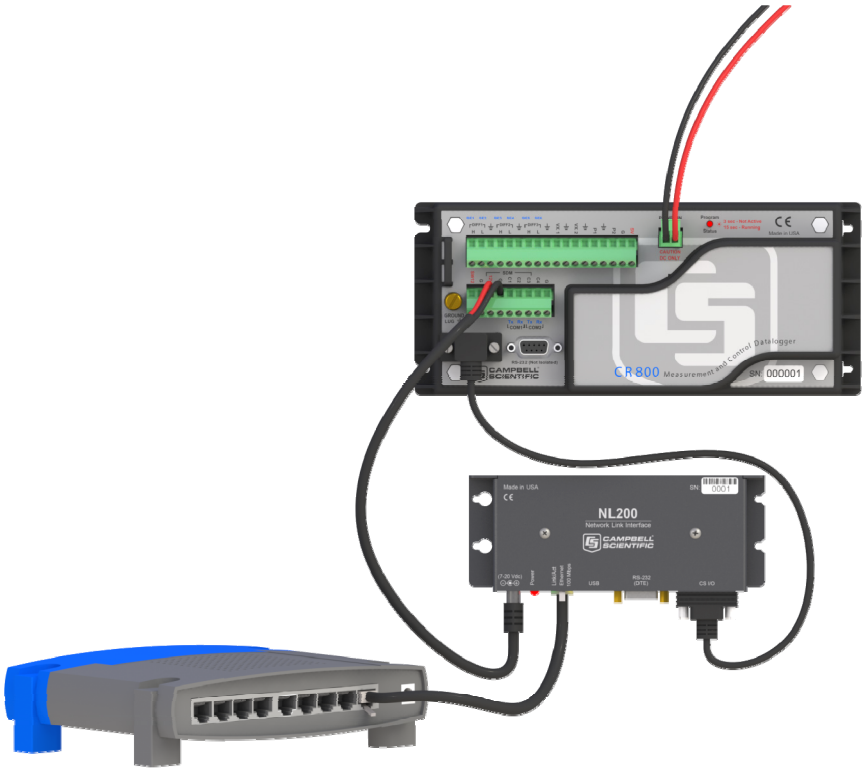


FIGURE 3-2. NL200 with CR800 (powered from datalogger)

3.2 Configuring the NL200

NOTE INSTALL the DEVICE DRIVER BEFORE plugging the NL200 into your PC for the first time. You will need the device driver properly installed before you can connect to the NL200 via USB. See Appendix D for instructions on installing the device driver.

- Ensure the NL200 is powered.
- Connect the supplied USB cable between a USB port on your computer and the USB port on the NL200.
- Open Device Configuration Utility.
- Under Device Type, select "NL200".
- Click the browse button next to "Communication Port".
- Select the port labeled "NL200".
- Click "OK".
- Click "Connect".
- To enter a static IP address, select 'disable' in the Use DHCP field. Then input the IP Address, Network Mask and Default Gateway. These values can be provided by your network administrator.
- If a dynamic address is to be used, the network information acquired via DHCP can be seen on the NL200 tab.
- Click "Apply" to save your changes.

NOTE It is recommended that a static IP address be given to the NL200 for most applications so that the path to the device is always known.

3.3 LoggerNet Set-up

The next step is to run LoggerNet and configure it to connect to the datalogger via the NL200.

- In LoggerNet's Setup Screen press Add Root and choose IPPort. Input the NL200's IP address and port number. The IP address and port number are input on the same line separated by a colon. If the NL200 is connected to the datalogger via CS I/O, then enter the CS I/O Serial Server port number after the IP address (e.g., 192.168.12.144:6783). If the NL200 is connected to the datalogger via RS-232, then enter the RS-232 Serial Server port number after the IP address (e.g., 192.168.12.144:6784). (The CS I/O Serial Server default port number is 6783. The RS-232 Serial Server default port number is 6784.)
- Add a PakBus Port.

- Add the datalogger and input the PakBus address of the datalogger.
- Press Apply to save the changes.
- You can verify your settings are correct by selecting the datalogger in the Network Map, selecting the Clock tab, and pressing “Check Clocks”. If your settings are correct, you should see the current clock of your server and datalogger.

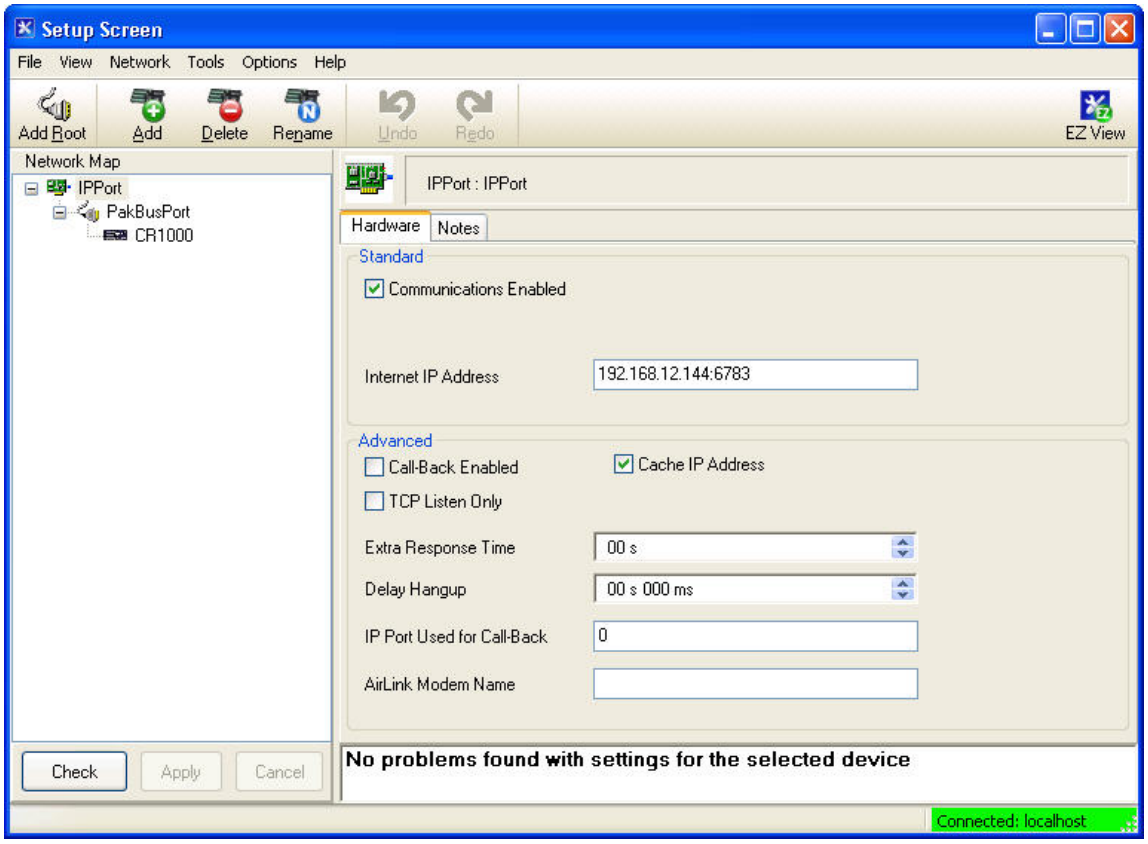


FIGURE 3-3. LoggerNet Setup

3.4 Connect

You are now ready to Connect to your datalogger using the LoggerNet Connect Screen.

4. Overview

The NL200 Network Link Interface is a device used to communicate with Campbell Scientific dataloggers and peripherals using an Ethernet 10/100 Mbps communications link. The NL200 includes a CS I/O port and a RS-232 port for communication. A USB device port is used for configuring the NL200 device.

FIGURE 4-1. NL200

The NL200 can be configured to bridge Ethernet and CS I/O communications (Bridge Mode Enabled). This mode is used for providing access to the internal IP functionality of the CR800/850, CR1000, and CR3000 (e.g., web page access, email, FTP, etc.). Bridge Mode does not utilize PPP. Instead, raw IP packets are transferred between the Ethernet and CS I/O connections.

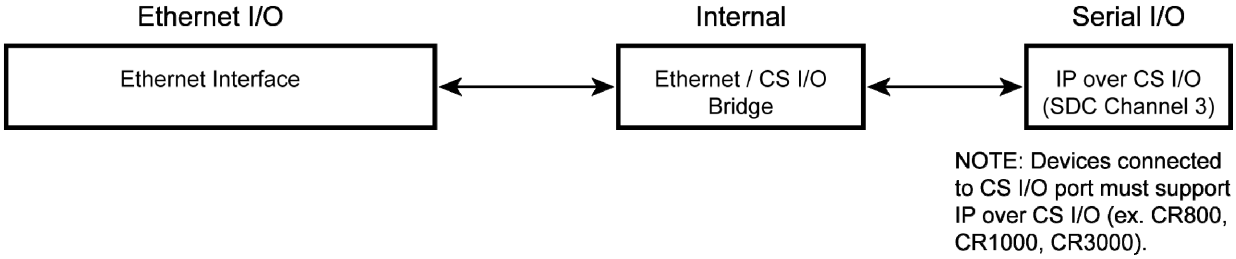

Ethernet I/O
Internal
Serial I/O
Ethernet Interface
Ethernet / CS I/O Bridge
IP over CS I/O (SDC Channel 3)
NOTE: Devices connected to CS I/O port must support IP over CS I/O (ex. CR800, CR1000, CR3000).

FIGURE 4-2. Bridge Mode enabled

With Bridge Mode disabled, the NL200 can be configured to act as a Serial Server and/or a PakBus Router. The NL200 can act as a Serial Server and PakBus Router simultaneously. However, each communication port (R2-232 and CS I/O) can only connect to one client (Serial Server or PakBus Router). Therefore, you can have an RS-232 Serial Server and a CS I/O Serial Server, an RS-232 Serial Server and a CS I/O PakBus Router, an RS-232 PakBus Router and a CS I/O Serial Server, or an RS-232 PakBus Router and a CS I/O

PakBus Router. In addition, the NL200 can act as TLS Proxy Server. The TLS Proxy Server is independent of other modes.

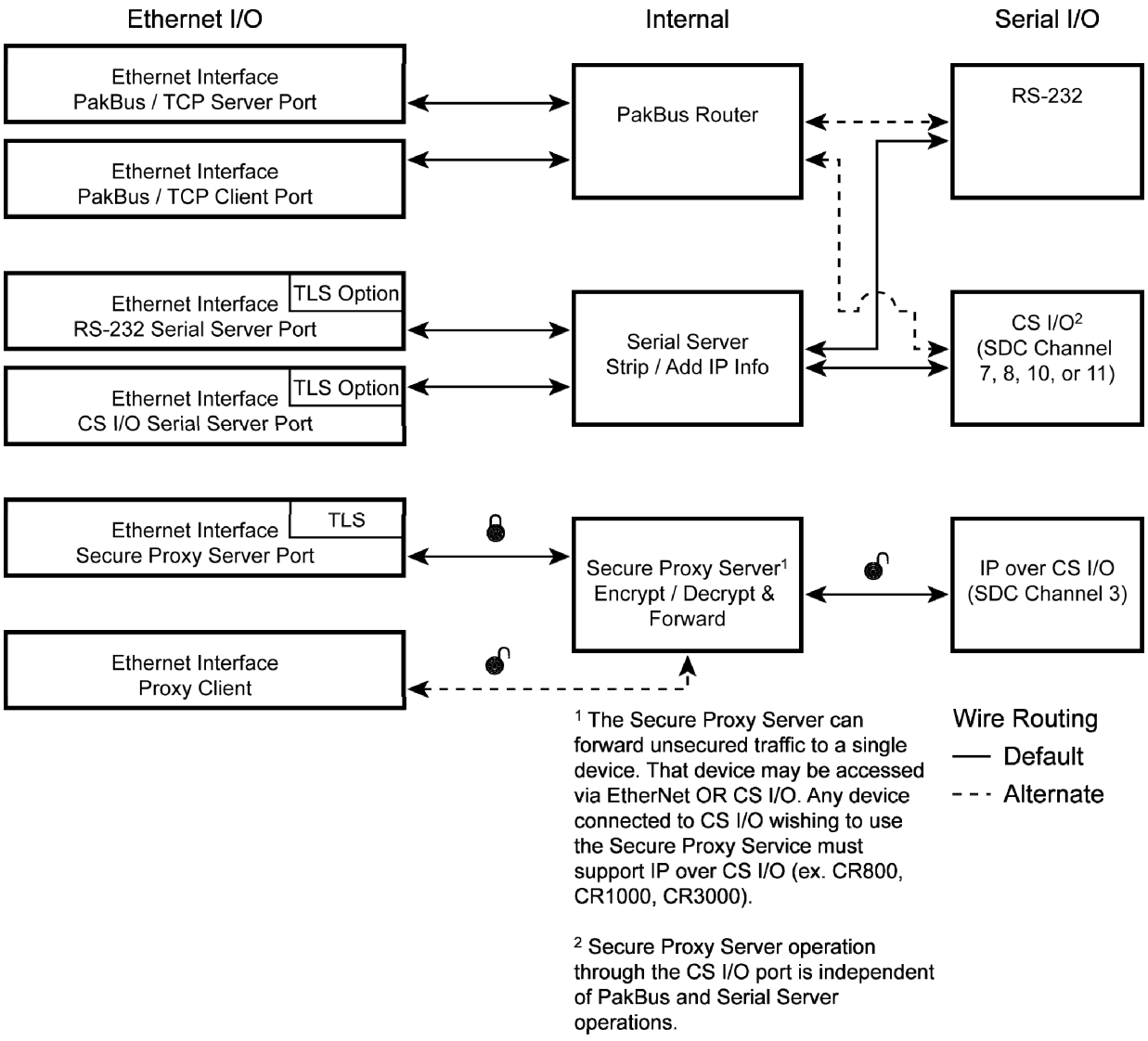

Ethernet I/O
Internal
Serial I/O
Ethernet Interface
PakBus / TCP Server Port
Ethernet Interface
PakBus / TCP Client Port
PakBus Router
RS-232
Ethernet Interface
RS-232 Serial Server Port
TLS Option
Ethernet Interface
CS I/O Serial Server Port
TLS Option
Serial Server
Strip / Add IP Info
CS I/O2
(SDC Channel
7, 8, 10, or 11)
Ethernet Interface
Secure Proxy Server Port
TLS
Secure Proxy Server1
Encrypt / Decrypt &
Forward
IP over CS I/O
(SDC Channel 3)
Ethernet Interface
Proxy Client
1 The Secure Proxy Server can forward unsecured traffic to a single device. That device may be accessed via EtherNet OR CS I/O. Any device connected to CS I/O wishing to use the Secure Proxy Service must support IP over CS I/O (ex. CR800, CR1000, CR3000).
2 Secure Proxy Server operation through the CS I/O port is independent of PakBus and Serial Server operations.
Wire Routing
Default
Alternate

FIGURE 4-3. Bridge Mode disabled

Some reasons you might want to use each of these modes are described below. Refer to Sections 6 and 7 for information on setting up your NL200 for each mode.

Campbell Scientific's LoggerNet software is used to communicate with the dataloggers once the NL200 is configured properly and connected to a network.

Bridge Mode

- Adds an Ethernet network interface to a CR800/850, CR1000, CR3000, CS110, ET107 or RAWS.
- Allows you to use the datalogger's internal IP functionality (web page access, email, FTP, etc.).

Serial Server

- Allows access to a CR10X-PB over Ethernet (CS I/O Serial Server).
- Allows access to a CR200X over Ethernet (RS-232 Serial Server).
- Allows access to a serial sensor over Ethernet (RS-232 Serial Server).
- Provides an Ethernet to RF500M/RF4XX Base. (RS-232 Serial Server).
- The connection can be secured via TLS. (See Section 7.4).

PakBus Router

- Allows you to connect to a PakBus Device on the RS-232 port and a PakBus Device on the CS I/O port using only one TCP port.
- Allows a device on the RS-232 port and a device on the CS I/O port to communicate without routing through the Ethernet.

TLS Proxy Server

- Adds an encrypted Ethernet network interface to a CR800/850, CR1000, CR3000, CS110, ET107 or RAWS.

5. Specifications

General

6.3 oz (177 g)
6.3" x 2.65" x 1" (16 x 6.73 x 2.54 cm)

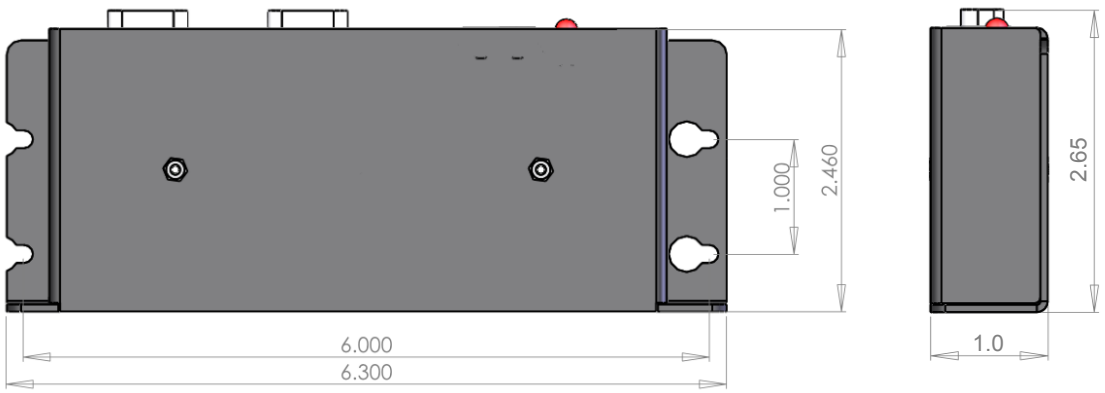


FIGURE 5-1. NL200 dimensions in inches

Power
DC Barrel Connector (not CS I/O or USB)
7-20 VDC
50 mA active, 2 mA standby @ 13 VDC

NOTE Standby power is when the IPNetPower instruction has been used to turn off power to the Ethernet. See the CRBasic help for an example of using the IPNetPower instruction. Note that the IPNetPower instruction is only applicable in Bridge Mode.

Operating Temperature
Standard -25° to +50°C

Configuration
Device Configuration Utility over USB (Micro-B) or Ethernet
Telnet console over Ethernet

CS I/O Port
SDC 7, 8, 10, 11 (does not support ME)
9600 to 115.2 kbps

RS-232 Port
DTE
1200 bps to 115.2 kbps

Ethernet
10/100 Mbps, IEEE 802.3, Auto-MDIX
IPv4, TCP, DHCP, Ping, Telnet, TLS, PakBus

Miscellaneous
Supports 20 simultaneous TCP Connections
Up to 10 of the 20 TCP connections can be used for TLS
PakBus Router supports 50 routes

Compliance
RoHS Compliant

Magnetic Isolation, ESD and Surge tested

The NL200 is encased in metal and meets requirements for a Class B device under European standards:

APPLICATION OF COUNCIL DIRECTIVE(S)
2004/108/EC

STANDARD(S) TO WHICH CONFORMITY IS DECLARED:
EN61326-1;2006

6. Configuring the NL200

The NL200 is configured using the Device Configuration Utility (DevConfig). You can connect your NL200 to DevConfig using either a network connection or USB.

6.1 Configuring the NL200 via Network Connection

NOTES

The NL200 must have an IP address before connecting via a network connection. If the address cannot be obtained via DHCP, you will need to configure your NL200 via USB the first time it is set up.

When the NL200 is in Bridge Mode, it can not be configured via a network connection. It can only be configured via USB.

- Ensure the NL200 is powered and connected to your network.
- Launch DevConfig.
- Under Device Type, select “NL200”.
- Check the box labeled “Use IP Connection”.
- Click the browse button next to “Communication Port”.
- Select the NL200 to be configured from the resulting pop-up window.
- Enter “NL200” in the TCP Password box. (“NL200” is the default administrative password. It can be changed via the DevConfig Deployment/NL200 tab.)
- Click “OK”.
- Click “Connect”.
- Configure the NL200 as needed for your application.
- Click “Apply” to save your changes.

6.2 Configuring the NL200 via USB

NOTE

INSTALL the DEVICE DRIVER BEFORE plugging the NL200 into your PC for the first time. You will need the device driver properly installed before you can connect to the NL200 via USB. See Appendix D for instructions on installing the device driver.

- Ensure the NL200 is powered.
- Connect the supplied USB cable between a USB port on your computer and the USB port on the NL200.

- Open DevConfig.
- Under Device Type, select “NL200”.
- Click the browse button next to “Communication Port”.
- Select the port labeled “NL200”.
- Click “OK”.
- Click “Connect”.
- Configure the NL200 as needed for your application.
- Click “Apply” to save your changes.

6.3 Configuring the NL200 via Telnet

NOTE The NL200 must have an IP address before connecting via Telnet. You will need to configure your NL200 via USB or Network Connection with DHCP the first time it is set up. Telnet is not available in Bridge Mode.

- Ensure the NL200 is powered and connected to your network.
- Type **Telnet <*NL200 IP address*>** at a command prompt. (If you have changed the NL200’s Telnet Port Number from its default value of 23, you will need to append this to the IP address with a space. For example, if the Telnet Port Number has been changed to 40, type: Telnet 192.168.12.144 <space> 40.)
- Input the NL200 Admin Password (default password is nl200).
- Type **help** to see a list of the functionality available when connected to the NL200 through telnet.
- Type **edit** and press Enter to edit the settings of the NL200.
- As each NL200 setting is shown, press Enter to accept the current value shown in parenthesis. Type a new value and press Enter to change the value.
- After progressing through all of the NL200 settings, type **Save** to accept the changes or **Cancel** to discard the changes.
- Type **bye** to exit Telnet.

7. Operation

This section describes how to configure your NL200 for different operational modes. See Section 4 for help in determining which mode to use.

7.1 Bridge Mode

7.1.1 Physical Set-up

Power the NL200 through the barrel connector jack located on the edge of the device. Connect the NL200 to your local network using an Ethernet cable, attaching one end to the NL200's Ethernet port and the other end to your network. Connect the supplied SC12 serial cable from the NL200's CS I/O port to the datalogger's CS I/O port.

7.1.2 Configuring the NL200

Connect to the NL200 in DevConfig (see Section 6). In the NL200 tab, set Bridge Mode to 'enable'.

7.1.3 Configuring the Datalogger

- Connect a serial cable from the PC COM port to the datalogger's RS-232 port.
- Open DevConfig. Select the device type of the datalogger (CR800, CR1000, or CR3000), the appropriate Communication Port and baud rate. Press the "Connect" button to connect to the datalogger.
- Under CS I/O Interface on the TCP/IP tab, input the IP Address, Subnet Mask and IP gateway. These values can be provided by your network administrator. If using DHCP, the address will automatically be displayed.
- Press the "Apply" button to save the changes and then close DevConfig.

NOTE The NL200 must be connected to the datalogger before configuring the datalogger with DevConfig. If it is not connected, the TCP/IP settings will not be displayed.

7.1.4 LoggerNet Set-up

The next step is to run LoggerNet and configure it to connect to the datalogger via the Ethernet port. (See example in Figure 7-1 below.)

- In LoggerNet's Setup Screen press Add Root and choose IPPort. Input the datalogger's IP address and port number. The IP address and port number are input on the same line separated by a colon. (The datalogger's default port number is 6785. It can be changed using DevConfig or by modifying its value in the Status Table. Unless firewall issues exist, the port number does not need to be changed from its default value.)
- Add a PakBus Port.
- Add the datalogger (CR800, CR1000, or CR3000) and input the PakBus address of the datalogger.

- You can verify your settings are correct by selecting the datalogger in the Network Map, selecting the Clock tab, and pressing "Check Clocks". If your settings are correct, you should see the current clock of your server and datalogger.

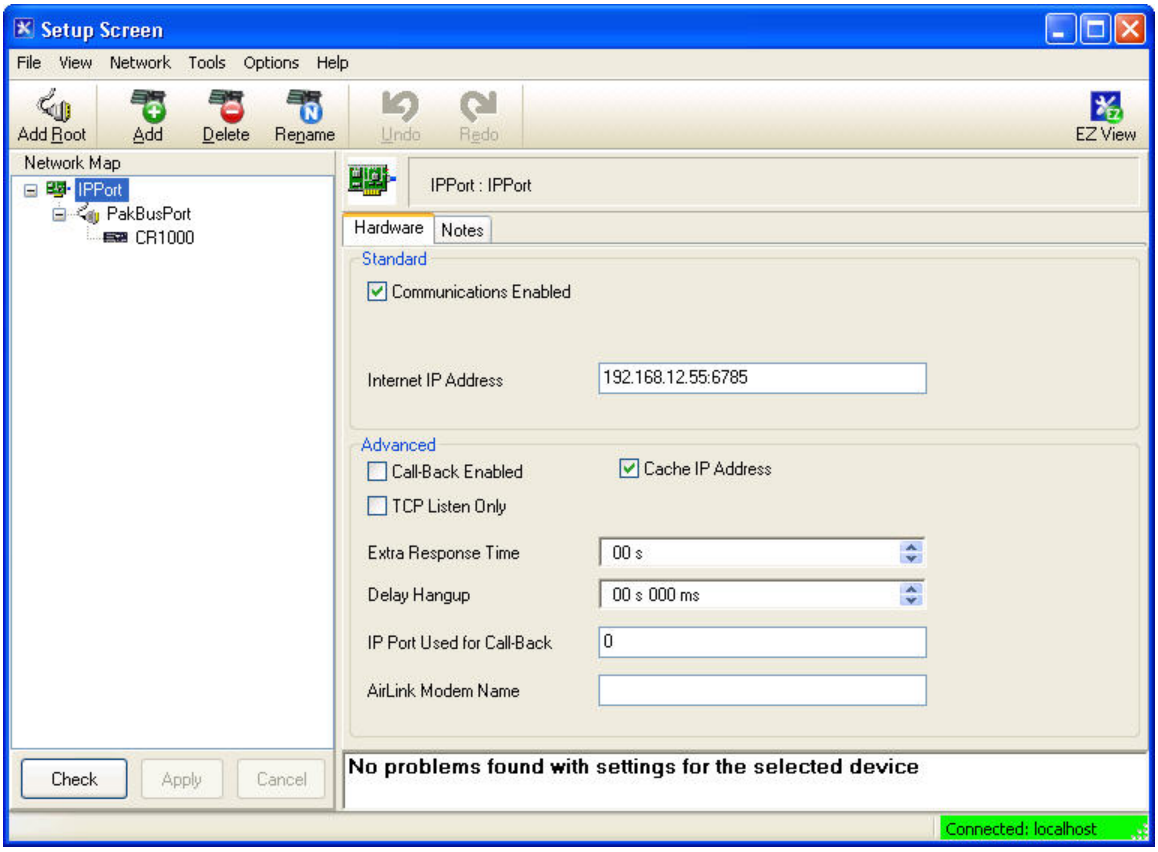


FIGURE 7-1. Bridge Mode LoggerNet Setup

7.1.5 Connect

You are now ready to connect to your datalogger using the LoggerNet Connect Screen.

7.2 Serial Server

The NL200 can tunnel RS-232 and CS I/O serial communications over Ethernet. Any packet sent to the configured Ethernet IP port will have the IP layer removed, and the serial data is then directed to the serial connection.

7.2.1 Physical Set-up

Power the NL200 through the barrel connector jack located on the edge of the device. Connect the NL200 to your local network using an Ethernet cable, attaching one end to the NL200's Ethernet port and the other end to your network. Connect the supplied SC12 serial cable from the NL200's CS I/O port to the datalogger's CS I/O port or from the NL200's RS-232 port to the datalogger's RS-232 port.

7.2.2 Configuring the NL200

RS-232 Serial Server

- Connect to the NL200 in DevConfig (see Section 6).
- Apply Factory Defaults. (Applying factory defaults is the easiest way to put the NL200 in Serial Server mode. However, if you have other settings that you do not wish to clear, you can just ensure that the settings below are configured correctly.)
- On the NL200 tab:
    - Set Bridge Mode to 'disable'.
- On the RS-232 tab:
    - Set Configuration to 'TCP Serial Server'.
    - Set Baud Rate to baud rate of attached device.
    - Make note of the Serial Server Port. (The default RS-232 Serial Server Port is 6784. Typically it is not necessary to change this entry from its default.)

CS I/O Serial Server

- Connect to the NL200 in DevConfig (see Section 6).
- Apply Factory Defaults. (Applying factory defaults is the easiest way to put the NL200 in Serial Server mode. However, if you have other settings that you do not wish to clear, you can just ensure that the settings below are configured correctly.)
- On the NL200 tab:
    - Set Bridge Mode to 'disable'.
- On the CS I/O tab:
    - Set Configuration to 'TCP Serial Server'.
    - Set SDC address. (Note that if multiple peripherals are connected to a datalogger's CS I/O port, each must have a unique SDC address.)
    - Make note of the Serial Server Port. (The default CS I/O Serial Server Port is 6783. Typically it is not necessary to change this entry from its default.)

7.2.3 LoggerNet Set-up

The next step is to run LoggerNet and configure it to connect to the datalogger via the Ethernet port. (See example in Figure 7-2 below.)

- In LoggerNet's Setup Screen, press Add Root and choose IPPort. Input the NL200's IP address and port number. The IP address and port number are input on the same line separated by a colon.
- Add a PakBus Port.
- Add the datalogger and input the PakBus address of the datalogger.
- Press Apply to save the changes.
- You can verify your settings are correct by selecting the datalogger in the Network Map, selecting the Clock tab, and pressing "Check Clocks". If your settings are correct, you should see the current clock of your server and datalogger.

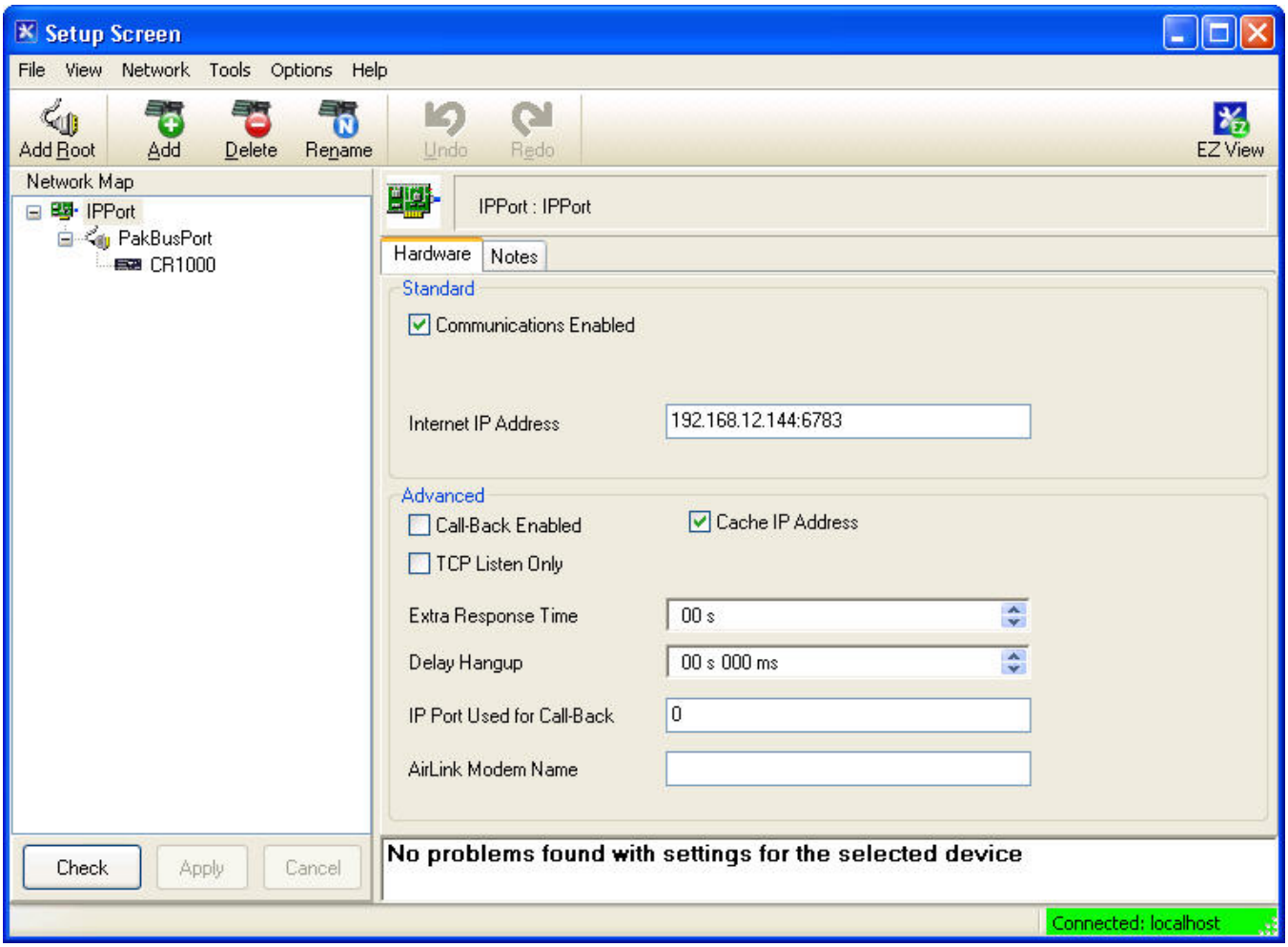


FIGURE 7-2. Serial Server LoggerNet Setup

7.2.4 Connect

You are now ready to Connect to your datalogger using the LoggerNet Connect Screen.

7.2.5 Serial Sensors

The NL200 configured as an RS-232 Serial Server as described above can be used to communicate with a serial sensor. However, LoggerNet is not capable of communicating with the serial sensor. You must have some other method of communicating with the sensor.

7.3 PakBus Router

When the RS-232 or CS I/O port is configured as a PakBus router, the NL200 can route packets to other devices in the network that it has in its routing table. These are devices that the NL200 has learned about through beaconing or allowed neighbor lists.

Beacon Interval - Devices in a PakBus network may broadcast a hello-message to other devices in order to determine "neighbor" devices. Neighbor devices are devices that can be communicated with directly by the current device without being routed through an intermediate device. A beacon in a PakBus network helps to ensure that all devices in the network are aware of which other devices are viable in the network. The beacon interval determines how often a beacon will be sent out. Set the beacon interval to 0 to disable beacons.

Verify Interval – This interval, in seconds, determines the rate at which the NL200 will attempt to start a hello transaction with a neighbor if no other communication has taken place within the interval. If Verify Interval is set to 0, the verify interval becomes 2.5 times the Beacon Interval. If both the Beacon Interval and Verify Interval are set to 0, the verify interval becomes 300 seconds.

Neighbors Allowed List - You can set a list of "acceptable neighbors" which the NL200 expects to hear from within set intervals (the **Verify Interval**). If the NL200 doesn't hear from neighbors in this list within the Verify Interval, it will attempt to contact them on its own. It will ignore all devices it hears that are not on the Neighbors Allowed List except if the PakBus address is ≥4000. Hellos from devices with PakBus address ≥4000 are automatically accepted as neighbors.

7.3.1 Physical Set-up

Power the NL200 through the barrel connector jack located on the edge of the device. Connect the NL200 to your local network using an Ethernet cable, attaching one end to the NL200's Ethernet port and the other end to your network. Connect the supplied SC12 serial cable from the NL200's CS I/O port to the datalogger's CS I/O port or from the NL200's RS-232 port to the datalogger's RS-232 port

7.3.2 Configuring the NL200

RS-232 PakBus Router

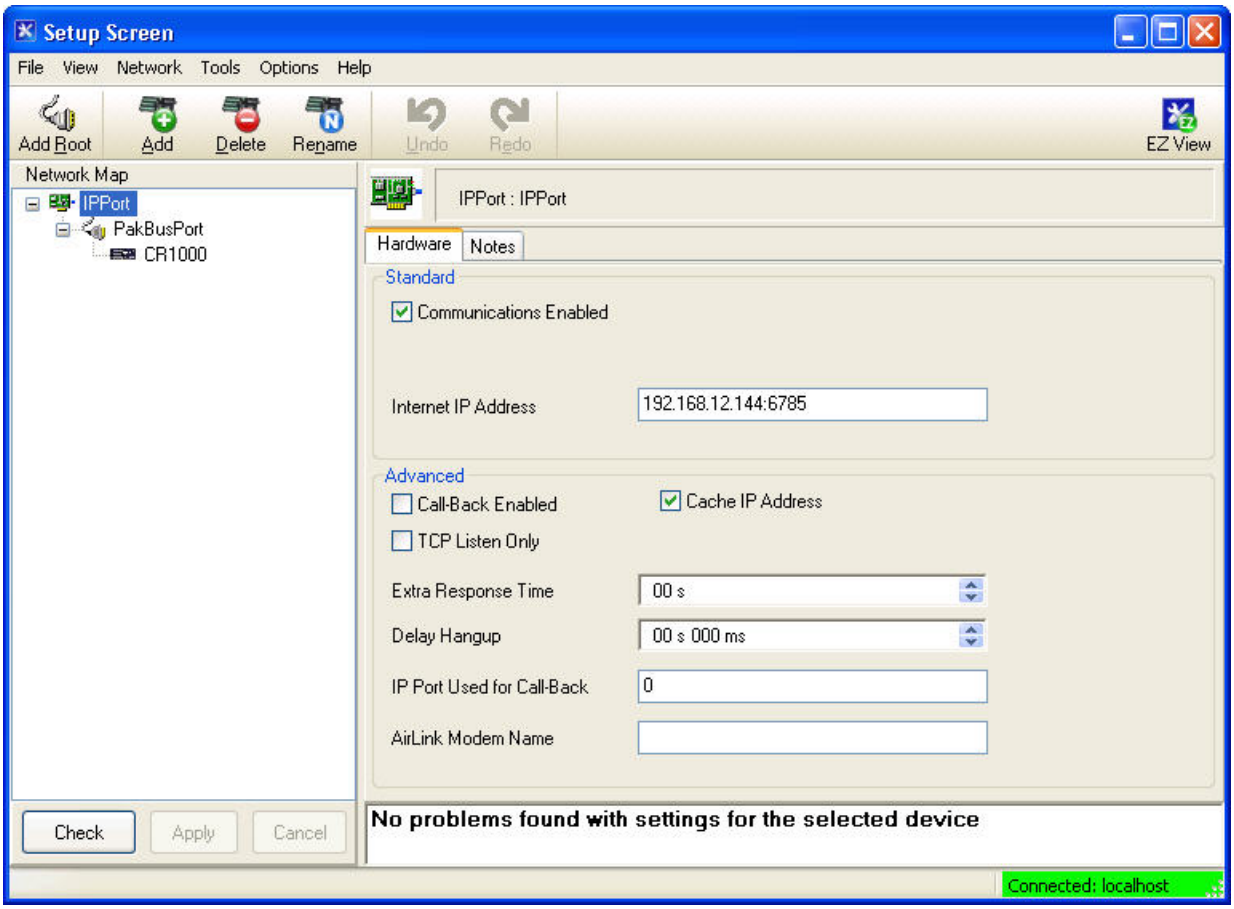
- Connect to the NL200 in DevConfig (see Section 5).
- On the NL200 tab:
    - Set Bridge Mode to ‘disable’.
- On the RS-232 tab:
    - Set Configuration to ‘PakBus’.
    - Set Baud Rate to baud rate of attached device.
    - Set Beacon Interval, Verify Interval, and PakBus Neighbors Allowed as described above. Often the default values can be used. However, an allowed neighbors list can be useful in restricting communication paths.
- On the Network Services tab:
    - Make note of the PakBus\TCP Server Port. (The default PakBus/TCP Server Port is 6785. Unless firewall issues exist, it is not necessary to change the port from its default value.)

CS I/O PakBus Router

- Connect to the NL200 in DevConfig (see Section 6).
- On the NL200 tab:
    - Set Bridge Mode to ‘disable’.
- On the CS I/O tab:
    - Set Configuration to ‘PakBus’.
    - Set SDC address. (Note that if multiple peripherals are connected to a datalogger’s CS I/O port, each must have a unique SDC address.)
    - Set Beacon Interval and Verify Interval as described above. Often the default values can be used.
- On the Network Services tab:
    - Make note of the PakBus\TCP Server Port. (The default PakBus/TCP Server Port is 6785. Unless firewall issues exist, it is not necessary to change the port from its default value.)

7.3.3 LoggerNet Set-up

- In LoggerNet's Setup Screen, press Add Root and choose IPPort. Input the NL200's IP address and port number. The IP address and port number are input on the same line separated by a colon.
- Add a PakBus Port.
- Add the datalogger and input the PakBus address of the datalogger.
- Press Apply to save the changes.



7.3.4 Connect

You are now ready to Connect to your datalogger using the LoggerNet Connect Screen.

7.4 TLS

The implementation of TLS in the NL200 is provided so that secure encrypted communications can be established between a TLS client and the NL200.

The TLS client can be a web browser using HTTPS, DevConfig, or a user-supplied TLS client. The NL200 can also act as a TLS Proxy Server with a datalogger.

In order to use TLS, the user is responsible for obtaining their own TLS Private Key and TLS Certificate.

The following NL200 settings apply to all TLS communications in the NL200:

NOTE The TLS Settings described below cannot be edited over a standard TCP DevConfig link. The TLS Private Key, TLS Private Key Password and TLS Certificate can only be edited/transmitted over a secure DevConfig link (USB or TLS). See Section 7.4.2 for information on configuring these settings.

TLS Status

Specifies the current status of the NL200 TLS network stack, i.e., initialized or not initialized. The status will read "Initialized" if a TLS Private Key and TLS Certificate are loaded in the NL200.

NOTE If the status of the TLS stack is "Initialized" then the NL200 will automatically negotiate a secure TLS connection with DevConfig if the Use IP Connection option is selected.

TLS Private Key Password

Specifies the password that is used to decrypt the TLS Private Key.

NOTE This setting is only visible/editable if the DevConfig connection is over USB or TLS.

TLS Private Key

Specifies the private key (in PEM format) for the encryption stack.

NOTE This setting is only visible/editable if the DevConfig connection is over USB or TLS.

TLS Certificate

Specifies the public certificate (in PEM format) for the encryption stack.

NOTE This setting is only visible/editable if the DevConfig connection is over USB or TLS.

7.4.1 HTTPS

HTTPS is a protocol that provides secure identification and encrypted communication over TCP.

In order to use HTTPS, you will need to load your TLS Private Key and TLS Certificate into the NL200. This is done from the Settings Editor | TLS tab in DevConfig over a USB or TLS connection these settings are not visible over a

standard IP connection. Once the private key and certificate are loaded successfully, the TLS Status field should read "Initialized".

You are then able to open a secure browser connection to your datalogger.

NOTES

HTTPS is the only protocol that is currently supported. (FTPS, Telnet SSL, and others are not supported.)

See your datalogger manual for more information on using HTTPS with your datalogger.

7.4.2 DevConfig TCP Encrypted Communication to the NL200

In order to use DevConfig TCP Encrypted Communication to the NL200, you will need to load your TLS Private Key and TLS Certificate into the NL200. This is done from the Settings Editor | TLS tab in DevConfig. Once the private key and certificate are loaded successfully, the TLS Status field should read "Initialized".

To use TCP Encrypted Communication, select the Use IP Connection check box in DevConfig. Input the NL200's IP address (or press the browse button to select it from a list of NL200s connected to the network) and press Connect.

NOTES

If the status of the TLS stack is "Initialized" then the NL200 will automatically negotiate a secure TLS connection with DevConfig if the Use IP Connection option is selected.

Encrypted Communication is required to change the TLS Private Key and/or TLS Certificate via TCP. The private key and certificate cannot be initialized via TCP, since the connection is not encrypted. They must be initialized through a direct USB connection to the NL200.

When the NL200 is in Bridge Mode, it cannot be configured via a network connection. It can only be configured via USB.

7.4.3 TLS Serial Server

The NL200 supports connections from TLS clients. However, Campbell Scientific does not have any applications that support TLS. Therefore, the TLS client must be supplied by the user.

In order to use TLS Serial Server, you will need to load your TLS Private Key and TLS Certificate into the NL200. This is done from the Settings Editor | TLS tab in DevConfig. Once the private key and certificate are loaded successfully, the TLS Status field should read "Initialized".

You can then use DevConfig to set your RS-232 port or CS I/O port to TLS Serial Server.

Your user-supplied client will then be able to connect the NL200's TLS Serial Server.

7.4.4 TLS Proxy Server

A TLS proxy server is a device that acts as a secure intermediary for requests from clients seeking resources from other servers. A client connects to the proxy server, requesting some service, such as a file, connection, web page, or other resource, available from a different server. The proxy server evaluates the request according to its filtering rules. For example, it may filter traffic by IP address or protocol. If the request is validated by the filter, the proxy provides the resource by connecting to the relevant server and requesting the service on behalf of the client.

The following NL200 settings apply to the implementation of a TLS Proxy Server in the NL200. Set them from the Settings Editor | TLS Proxy Server tab in DevConfig as required for your application:

TLS Proxy Server (enable/disable)

When the NL200 TLS Proxy Server is enabled, the NL200 TLS server maintains a secure TLS connection with a remote TLS client and forwards information to the datalogger using a standard unencrypted TCP connection.

TLS Proxy Server Port Number

In order to communicate with the NL200 TLS server, the client application must open a socket to the NL200 TLS server. The socket of the NL200 TLS server is uniquely identified by the IP address of the NL200 and a port number. This entry defines the port number that the NL200 TLS Server is listening on.

If secure communications come in on this port, the NL200 will attempt to open a TCP connection to the datalogger on the 'TLS Proxy Forward Port Number' (default port is 6785).

Also, regardless of this setting, the NL200 TLS Proxy Server will always listen on the secure HTTP (HTTPS) port number 443. If a secure connection is established on this port the NL200 will attempt to communicate to the datalogger on the HTTP port 80 (port number range is 1..65535).

TLS Proxy Forward Physical Port

If the 'TLS Proxy Forward Physical Port' is set to CS I/O port, the NL200 will then open a TCP connection with the logger over the CS I/O port. Data transfer between the NL200 and the datalogger is an unencrypted TCP connection.

If the 'TLS Proxy Forward Physical Port' is set to Ethernet Port, then the NL200 will open an unencrypted TCP connection over Ethernet to the defined 'TLS Proxy Forward IP Address.'

TLS Proxy Forward IP Address

This setting is used if Ethernet Port is selected under 'TLS Proxy Forward Physical Port'. Secure communications received by the NL200 TLS Server will be forwarded on a non-secure unencrypted TCP connection to this IP address. A router may be used to create a private network to isolate the unencrypted communications between the NL200 and the datalogger from the unsecured network.

TLS Proxy Forward Port Number

If the 'TLS Proxy Forward Physical Port' is set to CS I/O port, the NL200 will open an unencrypted TCP connection with the datalogger over the CS I/O port. If the 'TLS Proxy Forward Physical Port' is set to Ethernet port, then the NL200 will open an unencrypted TCP connection over Ethernet on the defined 'TLS Proxy Forward IP Address.' to the datalogger.

This entry defines the port number that the NL200's TCP client will use to communicate with the dataloggers TCP server. The datalogger's PakBus/TCP server port must be set to communicate on this port number (default port is 6785).

If secure communications come in on the 'TLS Proxy Server Port Number', the NL200 will attempt to open a TCP connection to the datalogger on the 'TLS Proxy Forward Port Number'. Also, regardless of this setting, the NL200 TLS Proxy Server will always listen on the secure HTTP (HTTPS) port number 443. If a secure connection is established on this port the NL200 will attempt to communicate to the datalogger on the HTTP port 80.

Leave this setting at its default unless the datalogger is expecting communications on a different port (range 1..65535).

TLS Proxy Timeout (seconds)

This setting will determine how fast the proxy server/client sessions will timeout if no activity is detected. Set to 0 for no timeout (not recommended).

(Range 0..999 seconds)

8. Applications

8.1 Working around Firewalls

The NL200 can be used to provide a connection between LoggerNet and a datalogger when both are behind firewalls. The NL200 must be on a public IP address and acts as a common meeting place for all PakBus communications.

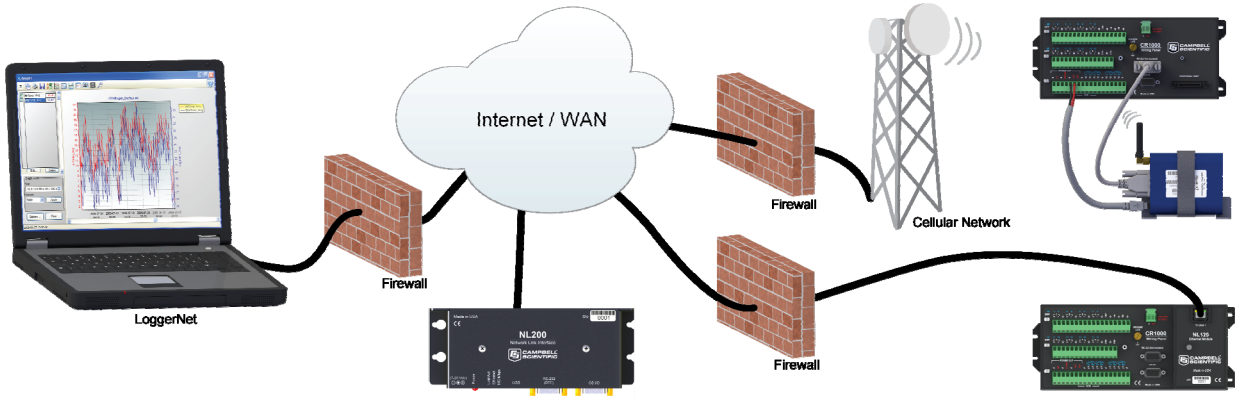


FIGURE 8-1. Working around firewalls

8.1.1 Configuring the NL200

- Connect to the NL200 in DevConfig (see Section 6).
- On the NL200 tab:
  - Set Bridge Mode to 'disable'.
  - Set Use DHCP to 'disable'.
  - Input the IP Address, Network Mask and Default Gateway. These values can be provided by your network administrator.
- On the Network Services tab:
  - Make note of the PakBus/TCP Server Port.

8.1.2 Configuring the Datalogger

NOTE The datalogger must first be configured for internet communication (i.e., through an NL115, an NL120, a second NL200, or a cellular modem).

- Connect a serial cable from the PC COM port to the datalogger's RS-232 port.
- Open DevConfig. Select the device type of the datalogger (CR800, CR1000, or CR3000), the appropriate Communication Port and baud rate. Press the "Connect" button to connect to the datalogger.
- On the Network Services tab:
  - Under PakBus TCP Client Connections, input the NL200's IP address and PakBus TCP Server Port.
- Press the "Apply" button to save the changes and then close DevConfig.

9. Troubleshooting

This section covers some common problems that might be encountered when using the NL200. This is not comprehensive but should provide some insight and ability to correct simple errors without a call to Campbell Scientific technical support.

When your Campbell Scientific software cannot establish a link to a remote datalogger that is connected to the NL200, check the following:

1. Check all your power connections.
   - Your NL200 and any hub and/or router being used must be connected to power. Check power indicator lights to make sure your devices are powered.

2. Check all your cables.

   - Verify that your Ethernet cable is securely plugged in between your NL200 and your hub, router, or PC. The yellow Link/Act light on the NL200 should start blinking when it is connected to the Ethernet.

   - If an Ethernet cable is connected but the Link/Act light is not blinking, try a new Ethernet cable. You can also try moving the existing Ethernet cable to a functioning system to determine if the cable is good.

3. Power cycle the NL200 and your hub/router/PC.

   - Turn off or unplug your hub/router/PC and NL200. Wait 10 seconds and then plug them back in or turn them on. A full restart may take 30 to 60 seconds.

4. Check the settings of the NL200.

   - Make sure the assigned NL200 IP address (DHCP or static) and the IP address of the PC you are trying to connect from are able to communicate each other. (Your network administrator can help you with this.)

     For example, the following addresses are able to communicate:

     NL200: IP address: 192.168.0.2, Network Mask: 255.255.255.0

     PC: IP address: 192.168.0.3, Network Mask: 255.255.255.0

   - If you are using DHCP to assign an IP address to the NL200, use DevConfig to read the IP address assigned to your NL200. This is done through a USB connection to the NL200 while the NL200 is connected to your network.

   - The IP address assigned to the NL200 must be unique on your network.

   - When Bridge Mode is enabled, the datalogger controls how the IP address is assigned. Make sure your datalogger is connected correctly to the NL200.

   - Try to ping the NL200 from your PC. (From the Windows Start Menu, choose Accessories | Command Prompt. Then type ping xxx.xxx.xxx.xxx where xxx.xxx.xxx.xxx is the IP address of your NL200.) If no packets are returned, this indicates that there is no network connection to that IP address.

5. Make sure the IP address and port number entered in LoggerNet/PC400/RTDAQ match the settings in the NL200.

   - Note that PakBus and serial server communications use different port numbers. The default port number for PakBus communications is 6785. The default port number for CS I/O serial server communications is 6783. The default port number for RS-232 Serial

Sever communications is 6784. The correct port number must follow the IP address of the NL200 in LoggerNet Setup in order for LoggerNet to communicate through the NL200. For example, if the NL200 is configured as a CS I/O Serial Server, in LoggerNet Setup enter the correct IP address of your NL200 followed by :6783 (e.g., 192.168.0.3:6783).

6. If you are unable to communicate with the NL200 via the USB cable, verify that you have installed the latest drivers for the NL200. These can be downloaded from our website, www.campbellsci.com.

7. If the NL200 is configured as a CS I/O Serial Server, verify that any other SDC device attached to the datalogger is using a different SDC address. For example, if the NL200 is configured for SDC7, any other device attached to the datalogger cannot use SDC7.

8. If communicating over a slow or intermittent connection, it may be necessary to lower the Maximum Packet Size of the datalogger in LoggerNet Setup and/or add Extra Response Time to the PakBus Port in LoggerNet Setup.

9. Reset the NL200 to its default settings.

   - If none of the above steps correct your communication problems, reset the NL200 to its default settings. This can be done using the Factory Defaults button in DevConfig or by using the Defaults command in a telnet session with the NL200.

Appendix A. Glossary

Beacon Interval

Devices in a PakBus network may broadcast a hello-message to other devices in order to determine "neighbor" devices. Neighbor devices are devices that can be communicated with directly by the current device without being routed through an intermediate device. A beacon in a PakBus network helps to ensure that all devices in the network are aware of which other devices are viable in the network.

Bridge (Bridging, Network Bridge)

In the context of this manual, bridging is the act of connecting two network interfaces at the data link layer. The NL200 acts as a semi-transparent bridge passing, without alteration, IP packets between the Ethernet and CS I/O ports.

DHCP (Dynamic Host Configuration Protocol)

A TCP/IP application protocol in which IP addresses are assigned automatically by a DHCP server. Note that an IP address obtained through DHCP is not static but is leased for a period of time set by the network administrator. The address may change, if the NL200 is powered down.

Hello Exchange

A communication exchange that establishes two PakBus devices as neighbors. A hello command packet is sent by one PakBus device (A) to another device (B). Device (B) then sends a hello response (A). The receipt of that packet establishes the two devices as neighbors. Only a hello exchange can establish two devices as neighbors.

Neighbor (PakBus Neighbor)

A device in a PakBus network that can be communicated with directly (i.e., not via a router). Every PakBus device maintains its own Neighbor List.

PakBus

Campbell Scientific's packet-switched communications protocol. Packets of information transmitted between PakBus devices contain user data and administrative information (a header) that routing devices use to move the packets to their ultimate destination. PakBus devices examine the header information and then either remove the header (at the packet's final destination) or forward the packet to another PakBus device.

PakBus Node

A device in a PakBus network. Each device in a network must have a unique PakBus address.

Port Number

A port number is a way to identify a specific process to which a network message is to be forwarded when it arrives at the NL200.

SDC (Synchronous Device Communications)

A Campbell Scientific addressable, synchronous communications protocol. The protocol allows multiple peripherals to be connected to the same device as long as each peripheral has a unique SDC address.

Serial Server

A serial server (also referred to as a terminal server) allows serial communication over an IP communications link.

Proxy (Proxy Server)

A device that acts as an intermediary for IP communications between two clients. In the context of this manual, the NL200 acts an intermediary between two or more clients requiring a secure connection (TLS) and one client requiring an unsecured connection. Communications are encrypted and decrypted as necessary for the two clients to communicate via the proxy.

TLS (Transport Layer Security)

An encryption protocol allowing secure client/server communications. A keyed message authentication code is used for message reliability.

Verify Interval

An interval of time that a PakBus device uses to determine when it is time send a hello message to another device to verify that they can still communicate.

Appendix B. Cables, Pinouts and LED Function

B.1 CS I/O

The CS I/O cable is a 9-pin straight-through cable with all 9 pins connected. The supplied SC12 cable (part number 16675) is recommended.

TABLE B-1. CS I/O Pinout

Pin	Datalogger (DE-9 Female) Function	Peripheral (DE-9 Male) Function
1	5 VDC	N/C
2	SIGNAL GND	SIGNAL GND
3	RING	RING
4	RXD	TXD
5	ME	ME
6	SDE	SDE
7	CLK/HS	CLK/HS
8	12 VDC	N/C
9	TXD	RXD

B.2 RS-232

A DB9 female to DB9 male cable (such as Campbell Scientific part number 10873) is used to connect the NL200's RS-232 port to the datalogger's RS-232 port. The supplied SC12 cable can also be used. A DB9 female null modem cable (such as Campbell Scientific part number 13657) is used to connect the NL200's RS-232 port to a PC's RS-232 port. The RS-232 cable should be kept at lengths of <6 feet to maintain high data throughput rates.

TABLE B-2. RS-232 Pinout

Pin	Datalogger (DCE, DE-9 Female) Function	Peripheral (DTE, DE-9 Male) Function
1	DCD	DCD
2	TXD	RXD
3	RXD	TXD
4	DTR	DTR
5	SIGNAL GND	SIGNAL GND
6	DSR	DSR
7	CTS	RTS
8	RTS	CTS
9	RING	RING

B.3 Ethernet

The Ethernet 10/100 Base-T cable should be a Category 5 or better twisted pair cable (such as Campbell Scientific part number 13658). The two active pairs in an Ethernet 10/100 Base-T network are pins 1 and 2 and pins 3 and 6. Use only dedicated wire pairs (such as blue/white and white/blue, orange/white and white/orange) for the active pairs.

TABLE B-3. Ethernet Pinout

Pin	Function
1	TD +
2	TD -
3	RD +
4	Not Connected
5	Not Connected
6	RD -
7	Not Connected
8	Not Connected

B.4 USB

The USB cable is the supplied USB A to micro B style cable (Campbell Scientific part number 27555). This is used only for device configuration.

TABLE B-4. USB Micro-B

Pin	Function
1	VBUS (Not Used)
2	Data -
3	Data +
4	N/C
5	GND

B.5 Power

TABLE B-5. Power In

Pin	Function
Center	7 – 20 VDC
Sleeve	Power GND

B.6 LEDs

TABLE B-6. Power LED	
State	**Description**
Off	Device powered off
On	Device powered on and ready
Blink	OS Download in progress – DO NOT DISCONNECT POWER

TABLE B-7. Ethernet LED	
State	**Description**
Yellow On	Valid Ethernet link
Yellow Off	Ethernet link not valid
Yellow Blink	Activity on Ethernet port
Green On	100Mbit/s link
Green Off	10Mbit/s link

Appendix C. NL200 Settings

All of the NL200 Settings available from the Settings Editor in DevConfig are described below.

C.1 Main Tab

Model (read only)

Model Name

Serial Number (read only)

Specifies the NL200 serial number assigned by the factory

OS Version (read only)

Operating System Version currently in the NL200

Compile Date (read only)

Operating System Compile Date

Bridge Mode

This setting is used to configure the device's mode of operation.

Bridge Mode Disabled

With Bridge Mode Disabled, the Serial Server (RS-232 or CS I/O), PakBus, and Secure Proxy Server functionalities are available. Refer to the respective device settings for the configuration of these functionalities.

Bridge Mode Enabled

With Bridge Mode Enabled, the device will act as a bridge from Ethernet to CS I/O. All IP packets that come in to the device via Ethernet will be communicated to a datalogger over the CS I/O port. Some filtering is done in order to minimize the amount of traffic on the CS I/O port but every packet that is transmitted to the logger is sent intact as a complete Ethernet/TCP packet. This enables the datalogger to use its TCP/IP stack to interpret the packet and therefore all of the datalogger's TCP services are available. In Bridge mode none of the other device settings are valid and all other functionality is disabled. All settings (i.e. IP, netmask, gateway) are configured in the datalogger.

NOTE When the device is configured in bridge mode it is not possible to configure it via TCP or open a telnet session with it.

DHCP

Enable if the device should be configured to use DHCP (Dynamic Host Configuration Protocol) to automatically acquire an IP address, subnet mask, and gateway from the local DHCP server. After DHCP is enabled the device will reboot and it may take a few moments to acquire the IP settings. In order to see the acquired settings you may have to do a refresh by hitting F5.

IP Address

The IP address uniquely identifies this node on an internet. If DHCP is enabled, this is the IP address obtained from the DHCP server. If DHCP is disabled, a static IP address must be obtained from your network administrator for use with this device. (It is recommended to configure a static IP address.)

NOTE In Bridge mode this setting is obtained from the datalogger and cannot be edited here. It must be edited in the datalogger settings. If the setting has been successfully obtained from the datalogger this setting will show "OK" otherwise it will show "0.0.0.0"

Subnet Mask

The Subnet Mask is used to select that portion of the IP address which identifies the network. It is used to facilitate routing and should be obtained from the network administrator along with the IP address. If DHCP is enabled, this is the Subnet Mask obtained from the DCHP server.

NOTE In Bridge mode this setting is obtained from the datalogger and cannot be edited here. It must be edited in the datalogger settings. If the setting has been successfully obtained from the datalogger this setting will show "OK" otherwise it will show "0.0.0.0"

Default Gateway

Datagrams being sent to an unknown network are routed via the Default Gateway. This entry specifies the Internet address of the Default Gateway. If no Default Gateway exists, set this entry to "0.0.0.0". If DHCP is enabled, this is the Default Gateway obtained from the DCHP server.

NOTE In Bridge mode this setting is obtained from the datalogger and cannot be edited here. It must be edited in the datalogger settings. If the setting has been successfully obtained from the datalogger this setting will show "OK" otherwise it will show "0.0.0.0"

MAC Address

Hardware MAC Address.

NOTE In Bridge mode the MAC address is shared with the datalogger. If the MAC address has been successfully shared with the datalogger this setting will show "OK" otherwise it will show "00:00:00:00:00:00"

Ethernet Speed / Duplex Configuration

Specifies the Ethernet link speed and duplex settings

Speed: When used as a TCP/IP serial server the overall data transfer speed is largely dependent on the speed of the serial port. Setting the Ethernet link speed to 100 Mbps will increase the overall data throughput rate by a relatively small amount, while setting it to 10 Mbps will conserve power.

Duplex: Setting the Duplex to Full allows communication in both directions simultaneously, while setting it to Half allows communication in only one direction at a time.

Setting the Ethernet Speed/Duplex Configuration to Auto will cause the NL200 to auto configure to the faster of the two speeds and fastest duplex setting according to the capabilities of the network.

Admin Password

To help guard against unauthorized access to the NL200 it is password protected by the Admin Password. This password will be required to gain access to the NL200 via DevConfig over TCP and telnet. If the password setting is left blank, no password is required to access the NL200. After settings are saved, the new password will be in effect.

TCP Configuration Port Number

The default TCP port number for configuration via TCP is 6786. This entry makes it possible for the user to change the port number used in TCP configuration if desired. Typically it is not necessary to change this entry from its default. (range 1..65535)

C.2 RS-232 Tab

RS-232 Configuration

This setting controls which process will be associated with the RS-232 port. The following values are defined:

TCP Serial Server
This port uses a TCP/IP based serial server.

TLS Serial Server
This port uses a TCP/IP/TLS based serial server.

PakBus
This port uses the PakBus protocol

Disabled
This port will not be used

RS-232 Serial Server Port Number

To communicate with a TCP/IP server, the client application must open a socket to that server. The socket of a specific server is uniquely identified by an IP address of the host where the server is running and a port number associated with the server application on that host. This entry is where the port number of the serial server is set. Typically it is not necessary to change this entry from its default. (range 1..65535)

RS-232 Baud Rate

This setting specifies the baud rate of the RS-232 port. The connected device must be set to communicate at the same baud rate.

RS-232 RTS

The NL200 asserts the RTS and DTR lines when doing RS-232 communications. This setting allows the user to disable the RTS line if needed so that it will not be asserted. Some hardware will not function if the RTS line is asserted but typically it is not necessary to change this setting from its default (enabled).

RS-232 Serial Server Timeout

This setting, in units of seconds, will determine how fast the RS-232 Serial Server will timeout if no activity is detected. Set to 0 for no timeout (not recommended). (range 0..999)

RS-232 PakBus Beacon Interval

This setting, in units of seconds, governs the rate at which the NL200 will broadcast PakBus messages on the associated port in order to discover any new PakBus neighboring nodes. It will also govern the default verification interval if the value of the Verify Interval setting for the associated port is zero.

RS-232 PakBus Verify Interval

This setting specifies the interval, in units of seconds, that will be reported as the link verification interval in the PakBus hello transaction messages. It will indirectly govern the rate at which the NL200 will attempt to start a hello transaction with a neighbor if no other communication has taken place within the interval.

Port Neighbors Allowed Settings

Example: (129,129) (1084, 1084)

In the example above, nodes 129 and 1084 are assigned as neighbors to the NL200.

This setting specifies, for a given port, the explicit list of PakBus node addresses that the NL200 will accept as neighbors. If the list is empty (the default value) any node will be accepted as a neighbor. This setting will not affect the acceptance of a neighbor if that neighbor's address is greater than 3999. The formal syntax for this setting follows:

```
neighbor    := { "(" range-begin "," range-end ")" }.
range-begin := pakbus-address. ;
range-end   := pakbus-address.
pakbus-address := number. ; 0 < number < 4000
```

C.3 CS I/O Tab

CS I/O Configuration

This setting controls which process will be associated with the CS I/O port. The following values are defined:

TCP Serial Server
This port uses a TCP/IP based serial server.

TLS Serial Server
This port uses a TCP/IP/TLS based serial server.

PakBus
This port uses the PakBus protocol

Disabled
This port will not be used

CS I/O Serial Server Port Number

To communicate with a TCP/IP server, the client application must open a socket to that server. The socket of a specific server is uniquely identified by an IP address of the host where the server is running and a port number associated with the server application on that host. This entry is where the port number of the serial server is set. Typically it is not necessary to change this entry from its default. (range 1..65535)

SDC Address

Communication with the datalogger via the CS I/O port is done using SDC (Synchronous Device Comms). The datalogger will address the devices with which it wishes to communicate using an SDC address. The CS I/O port can be configured to respond to SDC address 7, 8, 10, or 11.

CS I/O Serial Server Timeout

This setting will determine how fast the CS I/O Serial Server will timeout if no activity is detected. Set to 0 for no timeout (not recommended). (range 0..999) (seconds)

CS I/O PakBus Beacon Interval

This setting, in units of seconds, governs the rate at which the NL200 will broadcast PakBus messages on the associated port in order to discover any new PakBus neighboring nodes. It will also govern the default verification interval if the value of the Verify Interval setting for the associated port is zero.

CS I/O PakBus Verify Interval

This setting specifies the interval, in units of seconds, that will be reported as the link verification interval in the PakBus hello transaction messages. It will indirectly govern the rate at which the NL200 will attempt to start a hello transaction with a neighbor if no other communication has taken place within the interval.

C.4 Net Services Tab

Telnet

Enables/Disables the telnet service.

Telnet Port Number

The default TCP port number for the configuration monitor telnet session is 23. This entry makes it possible for the user to change the telnet session port number if desired. Typically it is not necessary to change this entry from its default. (range 1..65535)

Telnet Timeout

This setting, in units of seconds, will determine how fast the configuration monitor telnet session will timeout if no activity is detected. Set to 0 for no timeout (not recommended). (range 0..999)

Ping (ICMP)

The NL200 will not respond to 'Ping' requests if this setting is disabled.

PakBus Address

This setting specifies the PakBus address for this device. The value for this setting must be chosen such that the address of the device will be unique in the scope of the datalogger network. Duplication of PakBus addresses in two or more devices can lead to failures and unpredictable behavior in the PakBus network. When a device has a neighbor list or neighbor filter setting filled in for a port, any device that has an address greater than or equal to 4000 will be allowed to connect to that device regardless of the neighbor filter.

PakBus/TCP Server Port

This setting specifies the TCP service port for PakBus communications with the datalogger. Unless firewall issues exist, this setting probably does not need to be changed from its default value.

PakBus/TCP Password

Specifies the password that will be used to authenticate any incoming (server) or outgoing (client) PakBus/TCP sessions. This password is used by the server to generate a challenge to any client that connects to the PakBus/TCP server port. If the client fails to respond appropriately, the connection will be terminated. If this password is blank (the default value), no such authentication will take place.

PakBus/TCP Client Address (1-4)

This setting specifies the IP address of an outgoing PakBus/TCP client connection that the NL200 should maintain. If the connection fails, the NL200 will retry until the connection succeeds. No entry or a setting of 0.0.0.0 specifies that no client connection will be made.

PakBus/TCP Client Port (1-4)

This setting specifies the TCP port of the outgoing PakBus/TCP client connection. Typically it is not necessary to change this entry from its default. (range 1..65535)

Routes (read only)

This setting lists the routes that are known to the NL200. Each route known to the NL200 will be represented by the following four components separated by commas and enclosed in parentheses. The description of each component follows:

Port Number

Specifies a numeric code for the port that the router will use. Will correspond with one of the following:

0 CS I/O

1 RS-232

100 PakBus/TCP Connection — If the value of the port number is 100 or greater, the connection is made through PakBus/TCP.

Via Neighbor Address

Specifies the address of the neighbor/router that will be used to send messages for this route. If the route is for a neighbor, this value will be the same as the address.

PakBus Address

Specifies the address that the route will reach.

Response Time

Specifies the amount of time (in milliseconds) that will be allowed for the route.

C.5 TLS Proxy Server Tab

TLS Proxy Server Enabled

Enable/Disable the TLS Proxy Server. When doing TLS proxy communications, the device's TLS server maintains a secure TLS connection with a remote TLS client and forwards information onto a datalogger using a standard TCP connection. TCP ports and physical connections are configured below.

NOTE If the TLS Proxy Server is Enabled and a datalogger is connected to the CS I/O port then the datalogger will load its TCP stack in case it is required to do TCP communications. Running the TCP stack causes the datalogger to use more memory, leaving less for final storage etc. So if TCP/TLS server capability is not required the TLS Proxy Server should be left disabled.

TLS Proxy Server Port Number

When doing TLS Proxy communications the NL200 TLS server maintains a secure connection with a remote client. If the 'TLS Proxy Forward Physical Port' is specified to be the CS I/O port the NL200 will then open a TCP connection with the logger over the CS I/O port and do unecrypted data transfer with the logger. If the 'TLS Proxy Forward Physical Port' is specified to be the Ethernet port then the NL200 will open the TCP connection over Ethernet on the 'TLS Proxy Forward IP Address.'

In order to communicate with the NL200 TLS server, the client application must open a socket to that server. The socket of the NL200 TLS server is uniquely identified by the IP address and a port number. This entry is where the port number of the NL200 TLS server is set.

The TLS client needs to be set to communicate on this port number. If secure communications come in on the 'Secure Proxy Server Port Number' the NL200 will attempt to open a TCP connection to the datalogger on the 'Secure Proxy Forward Port Number'. Also, regardless of this setting, the NL200 Secure Proxy Server will always listen on the secure HTTP (HTTPS) port number 443. If a secure connection is established on this port, the NL200 will attempt to communicate to the datalogger on the HTTP port 80.

(range 1..65535)

TLS Proxy Forward Physical Port

When doing TLS Proxy communications, the NL200 TLS server maintains a secure connection with a remote client. If the 'TLS Proxy Forward Physical Port' is specified to be the CS I/O port the NL200 will then open a TCP connection with the logger over the CS I/O port and do unecrypted data transfer with the logger. If the 'TLS Proxy Forward Physical Port' is specified to be the Ethernet port then the NL200 will open the TCP connection over Ethernet on the 'TLS Proxy Forward IP Address.'

TLS Proxy Forward IP Address

Secure communications received on the NL200 TLS Server will be forwarded on a non-secure TCP connection to this IP address. If the 'TLS Proxy Forward Physical Port' is specified to be the CS I/O port, this setting is not set by the user as the NL200 will obtain the IP address of the datalogger automatically. If the 'TLS Proxy Forward Physical Port' is specified to be the Ethernet port then the forward IP address must be specified. Enter the IP address of the destination datalogger here.

TLS Proxy Forward Port Number

When doing TLS Proxy communications the NL200 TLS server maintains a secure connection with a remote client. If the 'TLS Proxy Forward Physical Port' is specified to be the CS I/O port, the NL200 will then open a TCP connection with the logger over the CS I/O port and do unecrypted data transfer with the logger. If the 'TLS Proxy Forward Physical Port' is specified to be the Ethernet port then the NL200 will open the TCP connection over Ethernet on the 'TLS Proxy Forward IP Address.'

In order to communicate with the connected datalogger's TCP server, the NL200's TCP client application must open a socket to that server. The socket of the datalogger's TCP server is uniquely identified by an IP address and a port number. This entry is where the port number of the NL200's TCP client is set. The datalogger's TCP server port must be set to communicate on this port number.

If secure communications come in on the 'TLS Proxy Server Port Number' the NL200 will attempt to open a TCP connection to the datalogger on the 'TLS Proxy Forward Port Number'. Also, regardless of this setting, the NL200 TLS Proxy Server will always listen on the secure HTTP (HTTPS) port number 443. If a secure connection is established on this port the NL200 will attempt to communicate to the datalogger on the HTTP port 80.

Leave this setting at its default unless the datalogger is expecting communications on a different port.

(range 1..65535)

TLS Proxy Timeout

This setting, in units of seconds, will determine how fast the proxy server/client sessions will timeout if no activity is detected. Set to 0 for no timeout (not recommended). (range 0..999)

C.6 TLS Tab

TLS Status (read only)

Specifies the current status of the TLS network stack.

NOTE If the status of the TLS stack is "Initialized" then the device will automatically negotiate a secure TLS connection with DevConfig if the Use TCP option is selected. The TLS Private Key, Private Key Password, and TLS Certificate can only be edited/transmitted over a secure DevConfig link (USB or TLS). These settings cannot be edited over a standard TCP DevConfig link.

TLS Private Key Password

Specifies the password that is used to decrypt the TLS Private Key

NOTE This setting can only be edited/transmitted if the DevConfig link is considered secure (USB or TLS). If the TLS stack has been initialized, the device will automatically negotiate a secure TLS connection with DevConfig if the Use TCP option is selected.

TLS Private Key

Specifies the private key (in PEM format) for the encryption stack

NOTE This setting can only be edited/transmitted if the DevConfig link is considered secure (USB or TLS). If the TLS stack has been initialized, the device will automatically negotiate a secure TLS connection with DevConfig if the Use TCP option is selected.

TLS Certificate

Specifies the public certificate (in PEM format) for the encryption stack

NOTE This setting can only be edited/transmitted if the DevConfig link is considered secure (USB or TLS). If the TLS stack has been initialized, the device will automatically negotiate a secure TLS connection with DevConfig if the Use TCP option is selected.

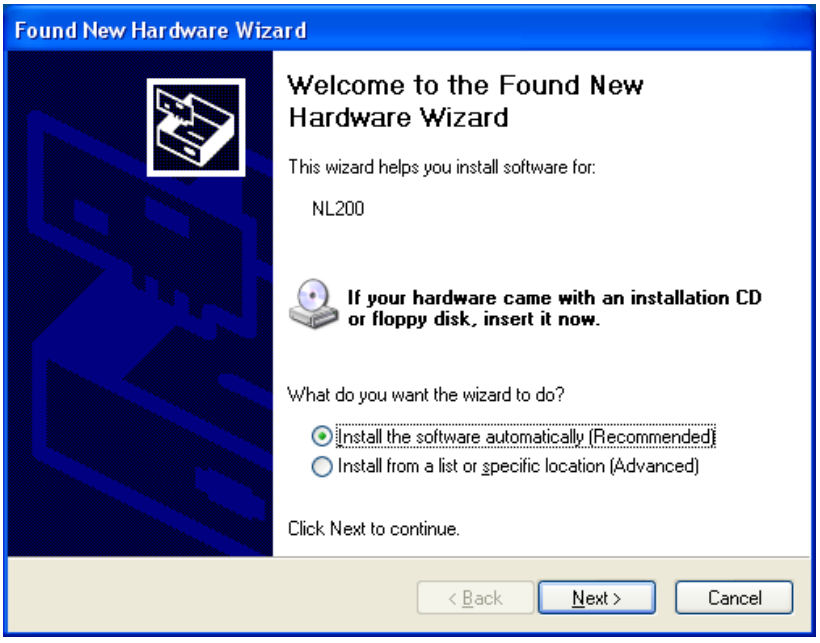
Appendix D. NL200 Driver Installation Instructions

If no NL200 has been previously plugged into your computer, it will be necessary to install the drivers for the NL200 to enable communication with this device. The driver is available on the driver disc that was shipped with the NL200. If that disc is no longer available, you can also download the drivers from Campbell Scientific's website.

D.1 Installing on Windows XP

1. Before you plug the NL200 into a computer USB port, you must first run the install utility on the NL200 install disc. This will ensure that the driver files are copied where the operating system can find them.

2. Connect a USB cable to the NL200 USB port and one of your computer's USB ports. After some delay, your computer should display a dialog similar to that shown below:


Found New Hardware Wizard
Welcome to the Found New Hardware Wizard
This wizard helps you install software for:
NL200
If your hardware came with an installation CD or floppy disk, insert it now.
What do you want the wizard to do?
Install the software automatically (Recommended)
Install from a list or specific location (Advanced)
Click Next to continue.
< Back
Next >
Cancel

3. Select Install the software automatically and click Next.

4. You will get a warning from the operating system indicating that the driver is "unsigned". In order to continue with installation, you need to select the Continue Anyway button.

Hardware Installation
The software you are installing for this hardware:
NL200
has not passed Windows Logo testing to verify its compatibility with Windows XP. (Tell me why this testing is important.)
Continuing your installation of this software may impair or destabilize the correct operation of your system either immediately or in the future. Microsoft strongly recommends that you stop this installation now and contact the hardware vendor for software that has passed Windows Logo testing.
Continue Anyway
STOP Installation

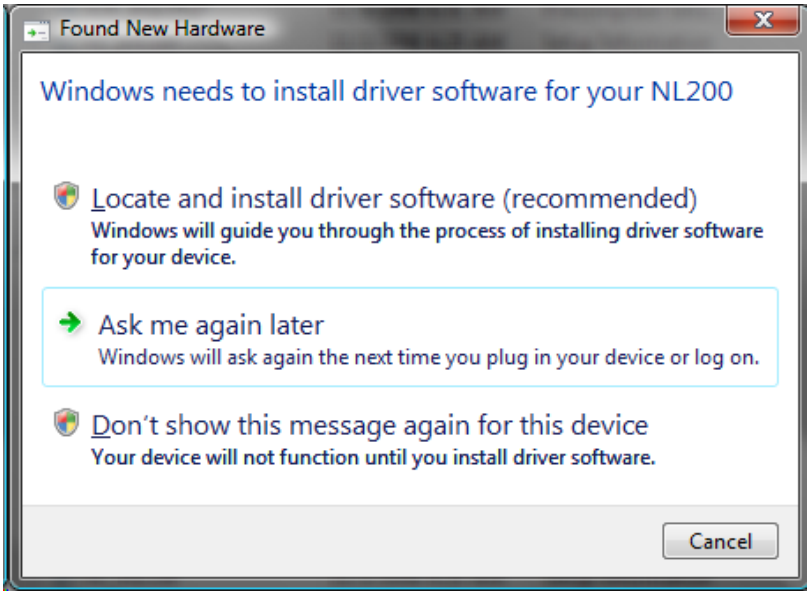
5. When the driver installation is completed, the following dialog should be shown:

D.2 Installing on Windows Vista

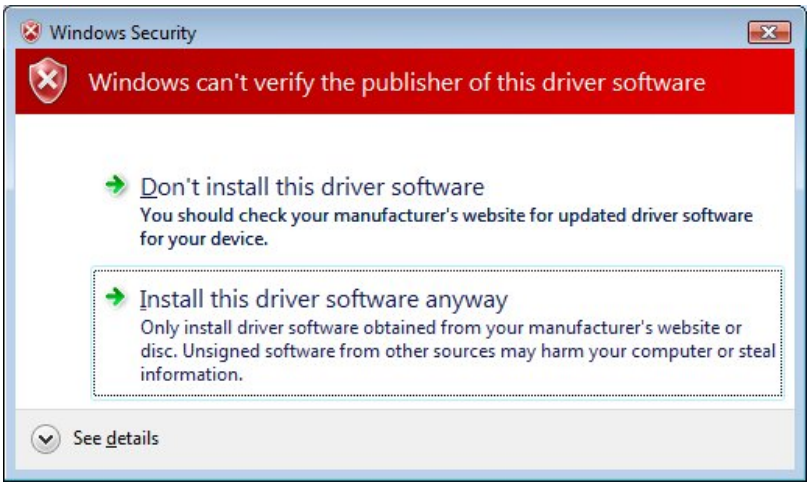
1. Before you plug the NL200 into a computer USB port, you must first run the install utility on the NL200 install disc. This will ensure that the driver files are copied where the operating system can find them.

2. Connect a USB cable to the NL200 USB port and one of your computer's USB ports.

3. After some delay, your computer should display a dialog similar to that shown below:


Found New Hardware
Windows needs to install driver software for your NL200
Locate and install driver software (recommended)
Windows will guide you through the process of installing driver software for your device.
Ask me again later
Windows will ask again the next time you plug in your device or log on.
Don't show this message again for this device
Your device will not function until you install driver software.
Cancel

4. Select the option to Locate and install driver software (recommended). Because the NL200 driver is not signed, the following will be displayed:


Windows Security
Windows can't verify the publisher of this driver software
Don't install this driver software
You should check your manufacturer's website for updated driver software for your device.
Install this driver software anyway
Only install driver software obtained from your manufacturer's website or disc. Unsigned software from other sources may harm your computer or steal information.
See details

5. Select the option to Install this driver anyway. At this point, the driver should be installed and the NL200 will be ready to configure and use.

D.3 Installing on Windows 7

1. Before you plug the NL200 into a computer USB port, you must first run the install utility on the NL200 install disc. This will ensure that the driver files are copied where the operating system can find them.

2. Connect a USB cable to the NL200 USB port and one of your computer's USB ports.

3. The operating system should now install the driver and will report that it is ready for use once it has been installed.

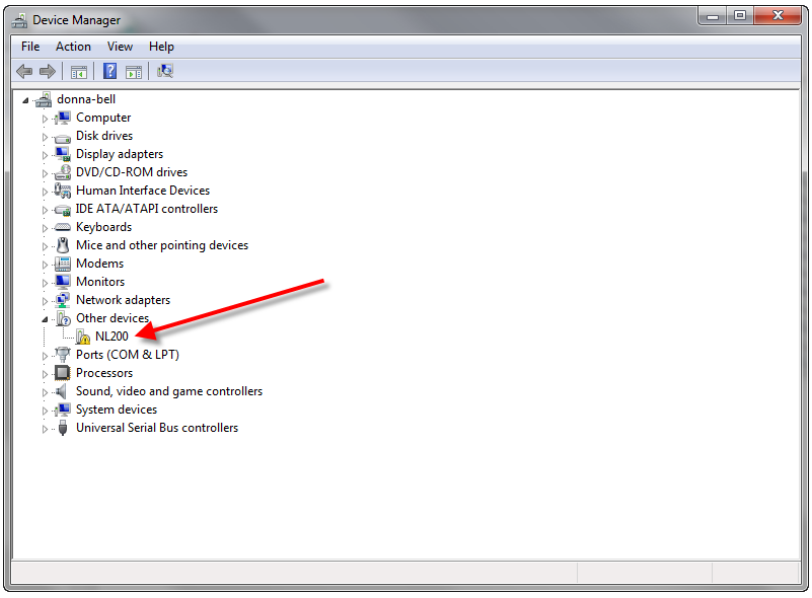
D.4 Oops! What if you plug the NL200 into your computer before installing the drivers?

1. Run the install utility on the NL200 install disc. This will ensure that the driver files are copied where the operating system can find them.

2. Connect a USB cable to the NL200 USB port and one of your computer's USB ports.

3. Open the Device Manager from the Windows' Control Panel.

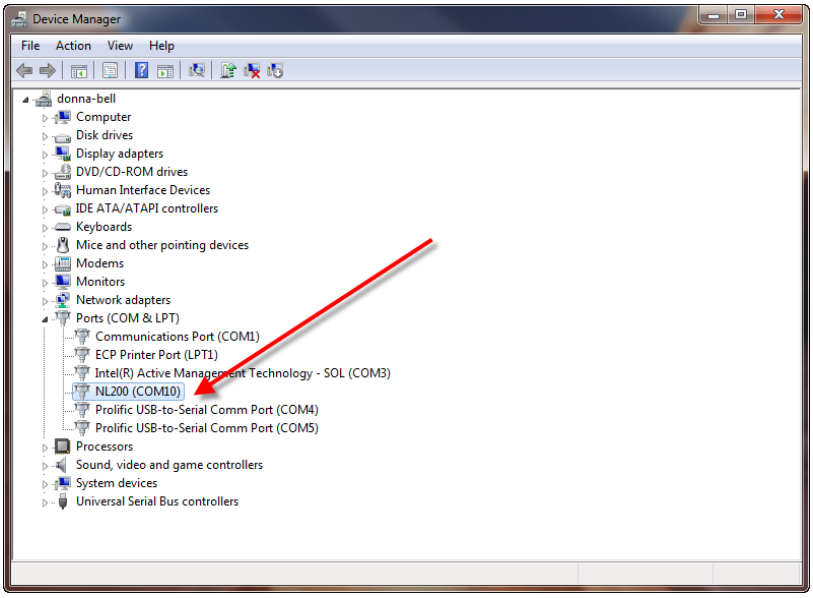
4. Find the NL200 under Other devices.



5. Right click on the NL200 and select "Scan for hardware changes".

6. Windows should then install the NL200 properly.

7. You should then see the NL200 in the Device Manager under Ports.



Appendix E. Sending a New OS to the NL200

Whenever a new operating system is released for the NL200, it will be available from our website: www.campbellsci.com/downloads.

Follow these steps to send the new OS to the NL200:

1. Plug the wall charger into an AC outlet and the barrel connector into the NL200's power jack.
2. Connect a USB cable between one of your computer's USB ports and the USB port on the NL200.
3. Open DevConfig.
4. Select the NL200 under Device Type.
5. Select the appropriate Communication Port.
6. Go to the Send OS tab.
7. Press the Start button.
8. In the resulting dialog box, select the file that should be sent to the device as an operating system (this file should have an .obj extension) and press the OK button.
9. The operating system will be sent to the NL200.
10. After the file has been sent, the power LED on the NL200 will blink repeatedly while the NL200 copies the OS into its internal flash. This process takes about 10 seconds. While the LED is blinking, the NL200 is in a vulnerable state where a removal of power will leave the NL200 without a valid operating system to run. DO NOT remove power until the LED stops blinking.

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